

Question one (compulsory)

- a) Briefly explain the meaning of the following:
- (i) Arc **(1mark)**
 - (ii) Chord **(1mark)**
 - (iii) Segment **(1mark)**
 - (iv) Sector **(1mark)**
- b) Find the wavelength, amplitude and phase angle of the following:
- (i) $y = -\sin(3x + 60)$ **(3marks)**
 - (ii) $-2y = 3\cos(x + 30)$ **(3marks)**
- c) Calculate the angles in a triangle whose lengths are 5.5cm, 4.2cm and 3.8cm **(5marks)**
- d) If $u=v$ and $u = hi + 3i - j + 4k + lk$ $v = 5i - j + 6k$ where h and k are constant.
Calculate the values of h and l **(4marks)**
- e) A stool is made up by shaping a tree stump into a conical frustum of vertical height 60cm. If the top radius is 12cm and the bottom one is 24cm. calculate the surface area of the stool. **(8marks)**
- f) Convert the following angles into radians
- (i) 10° **(1marks)**
 - (ii) 180° **(1marks)**
 - (iii) 270° **(1marks)**

Question Two

- a) Solve for θ such that $0 \leq \theta \leq 360^\circ$ and $2\sin^2 2\theta + \sin 2\theta - 1 = 0$ **(5marks)**
- b) When the angle of elevation of the sun is 58° , a vertical pole casts a shadow of length 5m on a horizontal ground; calculate the height of the pole. **(3marks)**
- c) Find the number of sides of:
- (i) A polygon having sum of interior angles 1080° **(2marks)**
 - (ii) A regular polygon if each exterior angle is 24° **(3marks)**
- d) A ship leaves port P through port Q. Q is 200km on a bearing of 220° from P. R is 420 km on a bearing of 140° from Q.
- (i) Using a suitable scale, draw a diagram showing the relative positions of the ports P, Q and R. **(3marks)**
 - (ii) By further drawing on the same diagram determine how far R is east of P. **(3marks)**

Question Three

- a) Given the vectors $AB = \begin{bmatrix} 2 \\ 3 \end{bmatrix}$ and $BC = \begin{bmatrix} -2 \\ 4 \end{bmatrix}$ work out.
- (i) $AB + BC$ **(1mark)**
 - (ii) $\frac{1}{2}BC$ **(1mark)**

- (iii) $AB=2BC$ (1mark)
- b) PQRS is a trapezium where PQ is parallel to SR, PR and SQ intersect at X so that $SX=kSQ$ and $PX=hPR$ where h and k are constants. Vectors $PQ=3\mathbf{q}$ and $PS=\mathbf{s}$. $SR=\mathbf{q}$.
- (i) Show this information on a diagram (2marks)
- (ii) Express vector SX in terms of k, \mathbf{s} and \mathbf{q} (3marks)
- (iii) Express vector SX in terms of h, \mathbf{s} and \mathbf{q} (3marks)
- (iv) Find h and k (4marks)
- c) Prove the following identity

$$\frac{(\cos\theta - \sin\theta)^2}{\cos\theta} = \sec\theta - 2\sin\theta$$

(5marks)

Question Four

- a) Construct a triangle ABC in which $AB=4.5\text{cm}$, $BC=6.5\text{cm}$ and $AC=7.5\text{cm}$. construct an escribed circle opposite to angle BAC. Measure the radius of the circle. (7marks)
- b) A plane flying at 200knots left an airport A(13°N , 31°E) and flew due north to an airport B(30°N , 31°E)
- (i) Calculate the distance covered by the plane in nautical miles (3marks)
- (ii) After 20mins stop over at B, the plane flew due east to an airport C (30°N , 13°E) at the same speed. Calculate the distance covered by the plane between B and C in nautical miles. (4marks)
- (iii) Calculate the total time taken to complete the journey from airport B to C. (3marks)
- c) Solve for θ given $0 \leq \theta \leq 360^{\circ}$ and $4 \sin 2\theta + 1 = 0$ (3marks)

Question Five

- a) Show that a triangle of sides 7, 24 and 25 is a right angled triangle. (3marks)
- b) Draw a triangle PQR such that $\angle PQR=75^{\circ}$ line $PQ=5.3\text{cm}$ and line $QR=4.5\text{cm}$. construct the locus of all points 2.5cm from Q and equidistant from P and R. mark this locus with P_1 and P_2 . Measure $P_1 P_2$ (8marks)
- c) Solve for θ given that:
- (i) $\sin\theta = \cos 15$ (3marks)
- (ii) $\sin(\theta + 20) = \cos(3\theta + 30)$ (3marks)
- d) The angle of depression of a boat from the top of a cliff is 65° . If the boat is 4m from the foot of the cliff. Calculate the height of the cliff. (3marks)